Simulation: Tracking of an object with only one sensor and only one base station.

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Simulation environment:

- IMU (with the characteristics of the InvenSense MPU9150 and a 240 Hz update rate)
- IMU Accelerometer spectral noise density: 0.008 m/s²/sqrt(Hz)
- IMU Accelerometer bias random walk: 0.001 m/s²/sqrt(s)
- One sensor
- Two base stations (at the beginning)
- Lighthouse update rate 60 Hz
- Lighthouse angle measurement white noise: 65*1e-6 rad

After 60 seconds, base station 2 is disabled. So there is only one sensor and one lighthouse for the rest of the simulation. The total simulation time is 240 seconds (but this can go on for > 1h). The user position is orbiting around location [4;4] with a velocity of about 0.3 – 0.5 m/s (figure 1). The object tracking is not lost, even with only one sensor and one base station due to the modelling of the system dynamics (supported by the IMU). As long as the Kalman filter prediction is corrected by single angle measurements, the tracking works. But it is not very accurate, as seen in figure 2. Though the accelerometer bias random walk is estimated quite well with only one base station (figure 3).

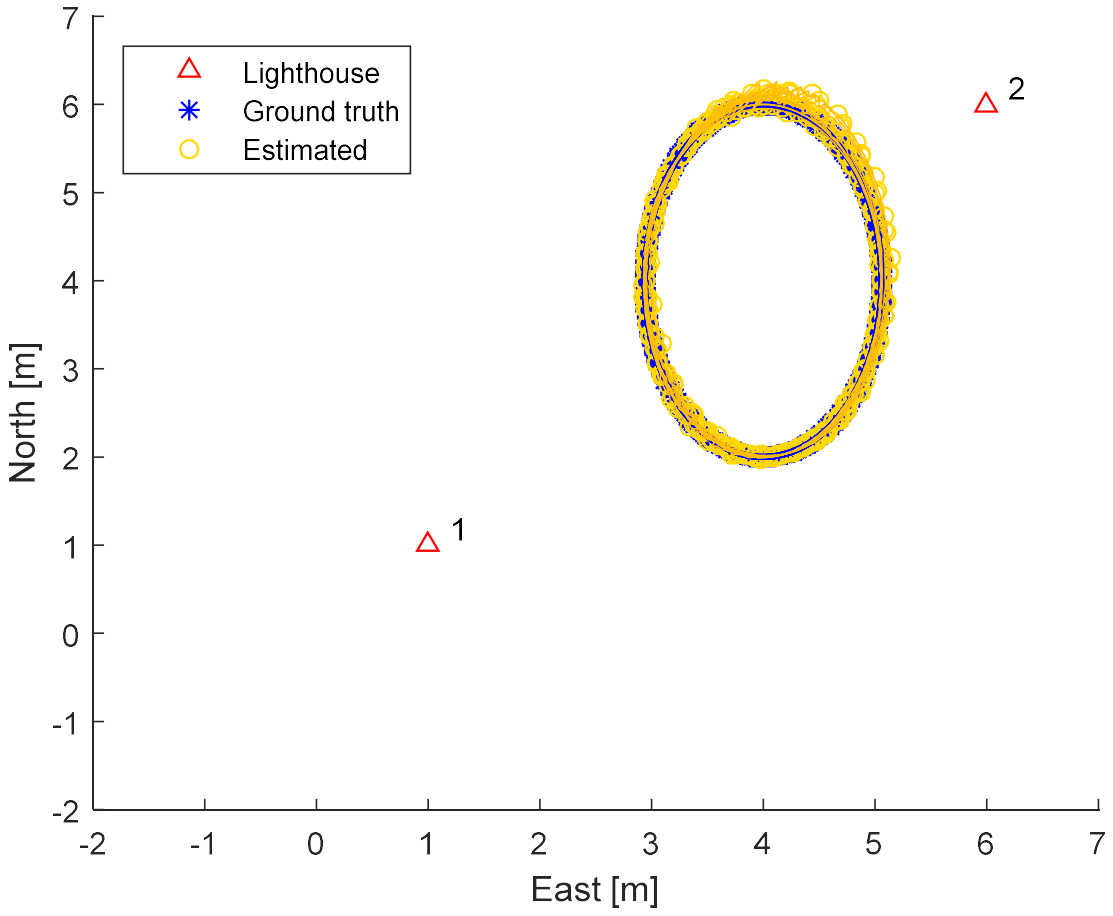

Figure 1Trajectory

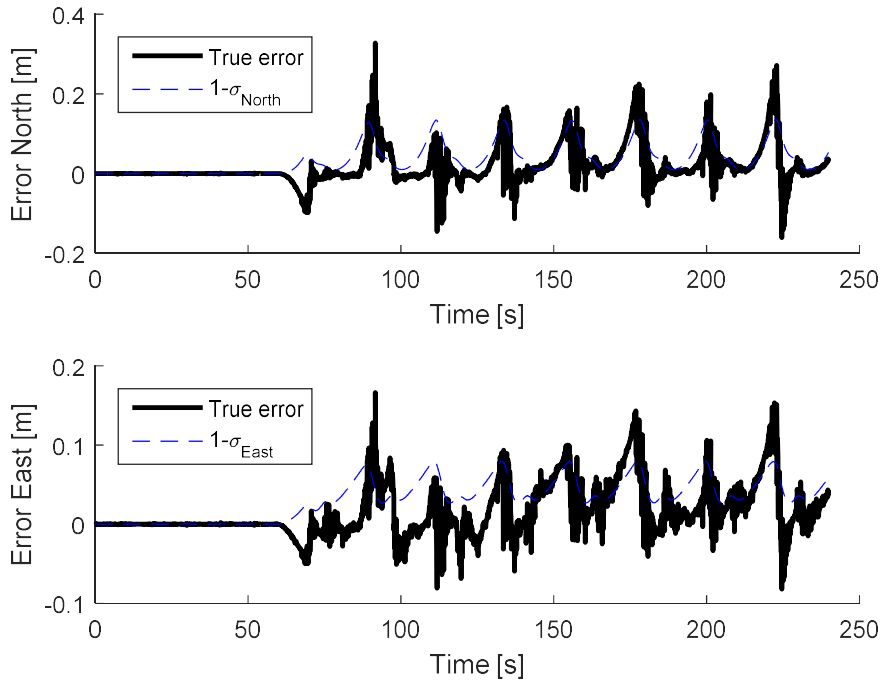

Figure 2 True errors from the simulation

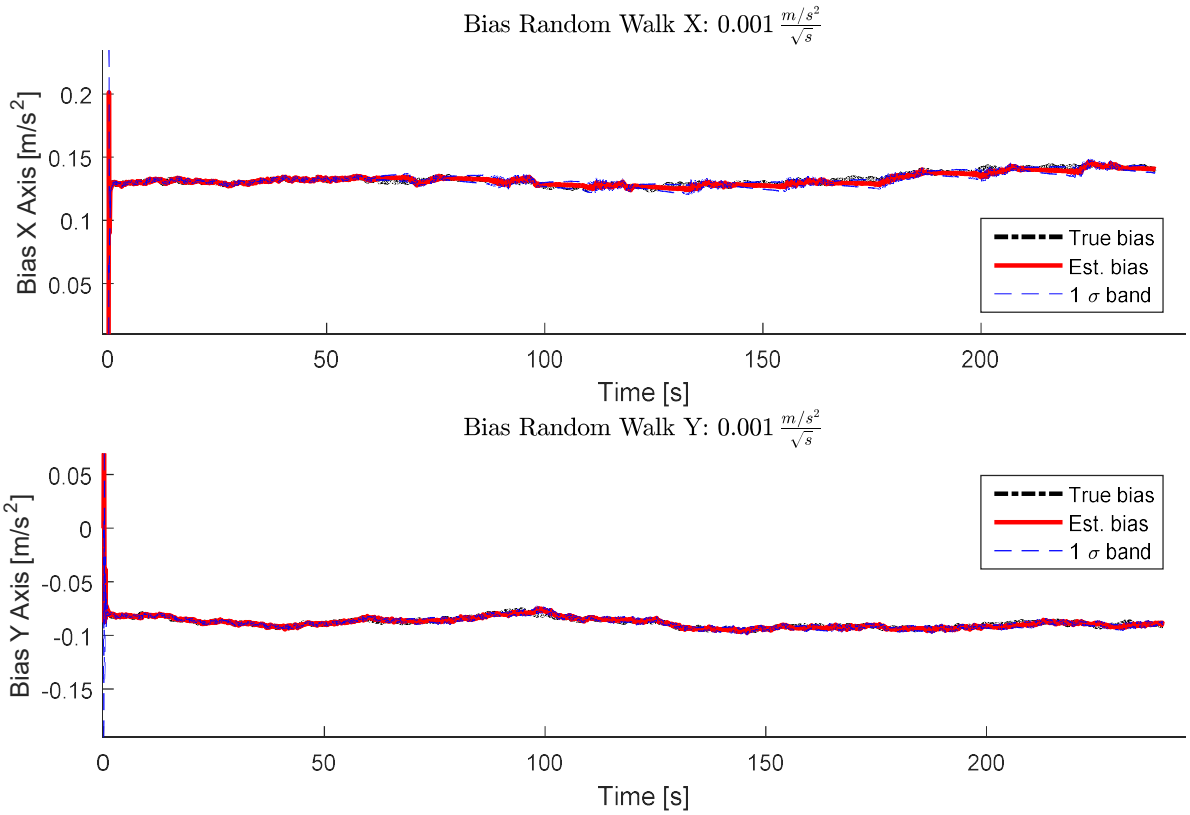

Figure 3 Estimation of accelerometer bias